

CHARACTERIZATION OF CIREN

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ABSTRACT

This paper focuses on the overall structure of the Crash Injury Research and Engineering Network (CIREN), how data are collected, and what makes it unique. It discusses how it can be used to expand and enhance the information in other databases. CIREN is a collaborative effort to conduct research on crashes and injuries at nine Level 1 Trauma Centers which are linked by a computer network. Researchers can review data and share expertise, which will lead to a better understanding of crash injury mechanisms and the design of safer vehicles. CIREN data are being used in outreach and education programs on motor vehicle safety. CIREN outreach and education has already been credited with lifesaving information dissemination.

INTRODUCTION

The Crash Injury Research and Engineering Network (CIREN) is a multi-center research program involving a collaboration of clinicians and engineers in academia, industry, and government pursuing in-depth studies of crashes, injuries, and treatments to improve processes and outcomes. Its mission is to improve the prevention, treatment, and rehabilitation of motor vehicle crash injuries, to reduce deaths, disabilities, and human and economic costs.

PROGRAM OVERVIEW

CIREN is a unique collaboration of medical practitioners, engineers, and other related crash professions. Working with nine multi-disciplinary, trauma centers, more is being learned about the dynamics of highway crashes. What is new about this venture is the joint support by vehicle manufacturers and government directing collaboration from engineering and medical fields to improve vehicle safety and trauma care. These real-world laboratories are linked by a computer network that allows researchers to review crash and injury data and share their particular expertise.

Unlike other NHTSA crash data collection efforts

where a case is triggered by the crash and case occupants can be included regardless of what medical facility they were transported to, CIREN focuses on people involved in motor vehicle crashes who are transported to a participating trauma center. Other selection criteria include: (1) frontal or side impacts involving late model year vehicles from the current year to those up to 6 model years, although some older vehicles may be chosen based on interest by the principal investigator and approval by the National Highway Traffic Safety Administration (NHTSA); (2) any impact where a child is injured; (3) all fire-related cases; and (4) rollovers with fewer than two quarter turns (although vehicles sustaining damage with more than two quarter turns may be enrolled with NHTSA approval based on principal investigator's interest in the injuries sustained).

Participating CIREN Centers collect data from approximately 50 motor vehicle crashes each year. Each CIREN case contains approximately 650 crash elements and 250 medical elements for each case occupant. Each occupant is considered a separate CIREN case. This differs greatly from the National Automotive Sampling System (NASS) or Special Crash Investigations (SCI) where one case can have several case occupants. CIREN Cases undergo a rigorous review by a multi-disciplinary in-house team of medical and engineering experts before being released for quality control review by an independent source who has experience with quality control review of NHTSA crash databases. All case data that would identify the personal identity of a case occupant in a specific crash or invade the privacy of a case occupant's sensitive medical information.

CIREN success depends on participation from a wide variety of parties who have not traditionally worked together.

CIREN crash investigators, like those working in the National Automotive Sampling System (NASS) and Special Crash Investigations (SCI), depend on the participation and cooperation of law enforcement agencies to obtain copies of the police crash reports, which provide key information on the location of the

crash and the vehicles involved. They also rely on cooperation of operators at tow yards, garages, and vehicle impounds, as well as the individuals involved in the crashes.

CIREN crash investigators inspect and photograph vehicles, measuring and documenting vehicle damage, and recording contact points inside the vehicle that resulted in occupant injury. They photograph and document evidence at the crash scene, determine vehicle velocity, and the direction of force during the crash. Vehicle occupants are also interviewed to try and get a complete picture of the crash scenario. These data are collected independently of the ongoing medical data collection. The CIREN medical research teams collect extensive medical data about the injured occupant. Data collected include vital signs from just after the crash (taken by EMS/first providers) to those taken upon



Conducting vehicle exterior inspections to assess damage

arrival at the trauma center, description of complications, surgical procedures, injuries sustained, and medical images (CT-scans, x-rays, MRIs) taken. Photographs are also taken to help document patient injuries. These photographs can be valuable in linking an injury to an injury source such as the telltale belt mark diagonally across the chest due to the safety belt. Greater insight has been gained into injuries caused by safety devices themselves, including shoulder and lap restraints and air bags as a result of this research.

Crash and patient data are combined in a multi-disciplinary case review team meeting. Physicians, engineers, and others use the merged data along with biomechanical and human organ system knowledge to identify specific injury mechanisms. Research completed to date has improved knowledge on



Capturing images to relate injuries to occupant contacts

mechanisms of occupant injuries, with findings published in leading medical journals. The results are immediately available to participating clinicians who may use this knowledge in their practice of medicine. CIREN's findings can be "put to work" immediately without any changes in regulation. CIREN forms the basis for "best practices" in blunt trauma care.

CIREN INFORMATION SYSTEM

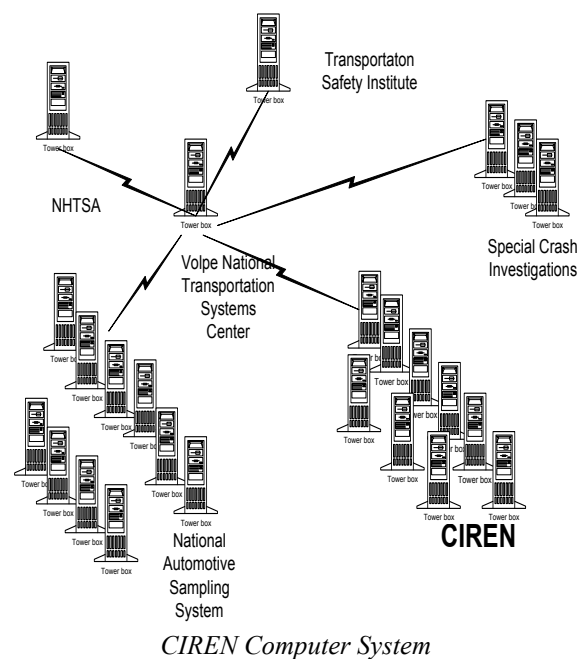
CIREN is also the name of a research database tool being developed, enhanced, and maintained by the Volpe National Transportation System Center in Cambridge, Massachusetts, to help researchers collect and review injury data.

The Crash Injury Research and Engineering Network (CIREN) database utilizes NHTSA's National Automotive Sampling System (NASS) Oracle data model as its basis. CIREN extends the NASS database by including over 250 additional detailed injury/medical variables in its data model. These medical variables are obtained from a variety of sources, including the National Trauma Registry, the Orthopedic Trauma Association, and the Uniform Pre-Hospital EMS Data Elements.

Both the centers and NHTSA are equipped with servers that are linked to VOLPE through a closed Wide Area Network. This allows the centers to share complete cases to conduct electronic "grand rounds" or review of selected portions of their research data with other CIREN participants.

RESULTS

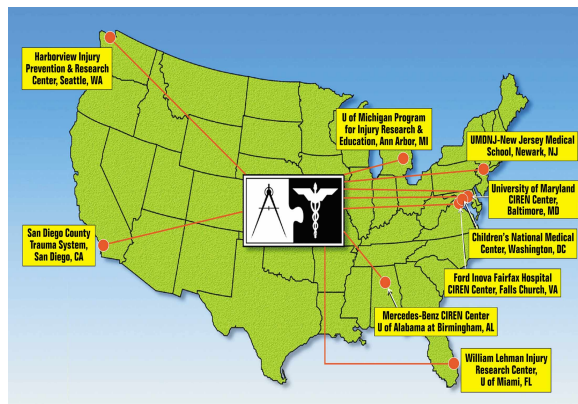
Since the 16th International Technical Conference on the Enhanced Safety of Vehicles, significant progress has been made in the Crash Injury Research and



Engineering Network (CIREN) Program.

CIREN has achieved its near-term goal of adding new partners. A new CIREN center at the University of Alabama at Birmingham was announced in April 1999. This CIREN center is entirely funded by Mercedes-Benz. Another new CIREN center at Inova Fairfax Hospital in Falls Church, Virginia, was announced in May 2000. This CIREN center is entirely funded by Ford Motor Company. The previous seven CIREN partners are: R Adams Cowley Shock Trauma Center, Baltimore, Maryland; University of Medicine & Dentistry/New Jersey Medical School, Newark, New Jersey; Children's National Medical Center, Washington, DC; Lehman Injury Research Center/University of Miami School of Medicine, Miami, Florida; University of Michigan Medical Center, Ann Arbor, Michigan; Harborview Injury Prevention Center, Seattle, Washington; San Diego County Trauma System, San Diego, California. This brings the total number of CIREN centers to nine geographically dispersed, Level 1 Trauma Centers. CIREN centers are in the process of utilizing information from CIREN cases representing real data

to enhance their outreach activities such as annual trauma nurse and Emergency Medical Technician (EMT) conferences, as well as annual conferences for surgeons and emergency room physicians. A number of presentations have been made by the centers to



Nine CIREN Center US Locations

local fire departments and first responders. CIREN have been presented at highway safety conferences and local high schools. Topics have included: occupant kinematics, crash study tests; basic trauma life support, mechanism of injury, airbags, trauma associated with car safety devices, new rules and what they mean to the orthopaedist, mechanisms of musculoskeletal injury in motor vehicle crashes. CIREN team members have also been educating and interacting with Emergency Medical Service (EMS) providers and law enforcement agencies.

NHTSA research and development members are currently working with representatives from NHTSA's Office of Traffic Safety Programs to coordinate the outreach and education into NHTSA's National program. CIREN has established outreach and education information dissemination programs at a number of its Level 1 trauma centers located throughout the United States. These CIREN centers are an excellent example of a public/private partnership that has already been credited with lifesaving results.

To date, CIREN has identified potentially life threatening liver injuries in adults and bowel perforations in children due to safety restraint

interaction in crashes. Additional findings of injury patterns are anticipated as the database is populated. As of the end of February 2001, more than 1000 CIREN cases have been entered into the computer

system.

CONCLUSIONS

We are beginning to understand how real-world crashes compare to the outcomes predicted by controlled crash test research. New safety devices such as advanced air bags and improved restraints, along with increased seat belt use, have resulted in higher survival rates in crashes that previously would have fatal consequences. Our understanding of injuries affecting infants and children has been significantly improved.

CIREN information dissemination is an important goal of the CIREN Program. In an effort to keep the public informed on CIREN findings, quarterly meetings were instituted in the Spring of 2000. These meetings took the place of annual conferences. Presentations from the three past annual conferences, as well as past quarterly meetings are available on the website.

Sanitized data are made available to the public for research purposes in summary form on CD-Rom and through the NHTSA/CIREN website. Complete case information will be available on the NHTSA/CIREN website by June 2001.

The NHTSA/CIREN website is:

http://www-nrd.nhtsa.dot.gov/include/bio_and_trauma/ciren-final.htm

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